REMARKS/ARGUMENTS

In the Office Action dated October 17, 2006 claims 1-22 were rejected under 35 U.S.C. §103(a) as being unpatentable over Dahlbäck (EP0674800, hereinafter "Dahlbäck") in view of Foster et al. (US4933136, hereinafter "Foster"). Claim 12 was rejected under 35 U.S.C. §101 as improperly defining a process. Claim 1-12 were rejected under35 U.S.C. §112, ¶2 as being indefinite. Claims 1, 8, and 20 have been objected to because of minor informalities.

Claims 1, 3-13, and 15-26 are pending in this application. Claims 1, 3, 6, 8, 12, 13, 15, 18, and 20 have been amended, claims 2 and 14 have been canceled, and new claims 23-26 have been added. Claims 1, 8, and 20 have been amended to correct the minor informalities, claim 12 has been amended to properly define a process, and these and the other claims have been amended to clarify the invention.

The Applicant respectfully submits that the present invention, according to claims 1, 3-13, and 15-26 is not unpatentable over the combination of Dahlbäck and Foster, because even if Dahlbäck and Foster were combined, as suggested by the Examiner, the result would not be the present invention, as claimed.

As described in the specification of the present application, there are two kinds of modern light water reactors: BWR and PWR. It is also described that very different conditions exist in these different kind of reactors and that the fuel assemblies and the cladding tubes therefore have different constructions. It should

be noted that the present invention is only concerned with a BWR. This fact is specified in the independent claims.

In a PWR a high pressure exists. When a cladding tube for a PWR is produced, normally a final stress relief anneal (SRA) is carried out. By using a SRA, the mechanical properties achieved through the previous production steps are maintained. The cladding tube is therefore mechanically very strong, which is important in a PWR, since a high pressure exists in such a reactor. In a BWR, on the other hand, the pressure is lower. This means that the mechanical requirements on a cladding tube for a BWR are not as high as on a cladding tube for a PWR. Furthermore, in a BWR the cladding tubes normally extend the whole way between a top plate and a bottom plate (see the first paragraph on page 2 in the specification of the present application). A cladding tube for a BWR is therefore more sensitive to bending, caused by neutron radiation (see the second paragraph on page 2 of the specification of the present application). If the final anneal is carried out such that a complete recrystallization occurs (we herein abbreviate a complete recrystallization cRXA), then the tendency to growth caused by neutron radiation is reduced. Furthermore, a cRXA tube has also been known to have a good resistance against damages caused by PCI (Pellet Cladding Interaction) as well as a good ductility. For these reasons, traditionally when producing cladding tubes for BWR, a final cRXA has been carried out (i.e. if a component with two layers is used, cRXA in both layers has been the case).

However, the inventors of the present invention have surprisingly found that an improved cladding tube for a BWR can be achieved by carrying out the final anneal such that the inner component is at least substantially completely recrystallized while the outer component is only partly recrystallized (pRXA). The inventors have surprisingly found that possible hydrides that are formed thereby tend to extend in essentially a tangential direction (and not in the radial direction), whereby an improved resistance against crack formation is obtained. The inventors have also found that since the inner component is at least substantially completely recrystallized and since the outer component is at least partly recrystallized, also the tendency for the cladding tube to grow due to neutron radiation is kept at a low level.

Dahlbäck discloses a method of manufacturing nuclear fuel elements comprising fuel rods whose cladding tubes are provided with an internal liner layer to obtain PCI resistance in the nuclear fuel element. As disclosed by Dahlbäck, a final anneal is carried out at 570°C for 1.5 hours (see column 6, lines 44-45). This final anneal disclosed by Dahlbäck is a cRXA. As explained above, this is typical for a cladding tube for a BWR. The final anneal in the Dahlbäck document is therefore in line with the tradition according to the prior art. Moreover, there is no suggestion whatsoever in the Dahlbäck document that the final anneal should be carried out in some other manner. Thus, Dahlbäck does not disclose or suggest the requirement of the present invention, for example,

according to claim 1, of finally annealing the cladding tube at a temperature and for a time such that the inner component substantially completely recrystallizes and such that the outer component partly recrystallizes but to a lower extent than the inner component, wherein said final annealing is carried out such that the degree of recrystallization in the outer component is higher than 50 %.

Foster discloses a tubular water reactor fuel cladding having an outer cylindrical layer composed of a conventional zirconium base alloy and a second layer composed of an alloy selected from a group of zirconium base alloys. In the passage from column 6, line 62 to column 7, line 16 Foster discusses the final anneal. It should be noted that the different alternatives described here concern samples produced (see column 6, line 62). Foster does not seem to explicitly discuss which of these alternatives is preferred. However, it can be noted that in the example 8.3 (pRXA inner layer and SRA outer layer) a high hardness is obtained, which may suggest that this is the preferred alternative according to Foster. Nevertheless, although Foster states different alternatives, Foster never discloses or suggests the requirement of the present invention, for example, according to claim 1, of finally annealing the cladding tube at a temperature and for a time such that the inner component substantially completely recrystallizes and such that the outer component partly recrystallizes but to a lower extent than the inner component, wherein said final annealing is carried out such that the degree of recrystallization in the outer component is higher than 50 %. present

invention, i.e. at least substantially cRXA inner layer and pRXA outer layer. Moreover, Foster never discloses or suggests that radial hydrides can be avoided by such a final anneal.

Thus, even if Dahlbäck and Foster were combined, the resulting combination still would not disclose or suggest the requirement of the present invention, for example, according to claim 1, of finally annealing the cladding tube at a temperature and for a time such that the inner component substantially completely recrystallizes and such that the outer component partly recrystallizes but to a lower extent than the inner component, wherein said final annealing is carried out such that the degree of recrystallization in the outer component is higher than 50 %. present invention, i.e. at least substantially cRXA inner layer and pRXA outer layer.

In our view, therefore, also the originally filed independent claims of the present application involve an inventive step in view of Foster. However, in order to even more clearly distinguish the present invention from the prior art, it has now also been stated in the independent claims that the degree of recrystallization in the outer layer is higher than 50%. There is no suggestion whatsoever in Foster to this feature.

The Examiner also refers to column 4, line 51 in Foster in order to show that the temperature of the final anneal should be performed below about 600°C, for example at or below about 550°C. However, such a final anneal temperature is

the case for all the three examples described in columns 6-7 in Foster. Consequently, the suggested final anneal temperature does not in any way indicate that the final anneal should be carried out such that a cRXA is obtained in the inner component while a pRXA is obtained in the outer component. Furthermore, the Examiner seems to suggest that by applying this teaching to the Dahlbäck document, a person skilled in the art would arrive at the subject matter of the present application. This is not the case. Foster suggests that the final anneal should be performed below about 600°C, preferably at or below about 550°C. This requirement is already fulfilled in the Dahlbäck document, since the final anneal is here performed at 570°C. However, as explained before, this anneal results in a cRXA in both the components. Furthermore, even if somebody, contrary to the teaching of Dahlbäck, would perform the final anneal at a lower temperature, there is no indication that such a final anneal would be performed such that cRXA would be obtained in the inner component, while pRXA is obtained in the outer component. Moreover, it is never disclosed or suggested, either in Foster nor in Dahlbäck, that the anneal should be carried out such that a recrystallization according to the present invention is obtained. Also, as already explained above, the anneal according to the present invention goes against the tradition for producing a cladding tube for a BWR, since the aim is normally to achieve cRXA in both components.

Therefore, the Applicant respectfully submits that the present invention, according to claim 1, and according to claim 13, which is similar to claim 1, and according to claims 3-12, and 15-26, which depend therefrom, is allowable over the combination of Dahlbäck and Foster.

Each of the claims now pending in this application is believed to be in condition for allowance. Accordingly, favorable reconsideration of this case and early issuance of the Notice of Allowance are respectfully requested.

Additional Fees:

The Commissioner is hereby authorized to charge any insufficient fees or credit any overpayment associated with this application to Deposit Account No. 19-5127 (19378.0089).

Respectfully Submitted,

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